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14. ABSTRACT

Naval Hospital Jacksonville, FL, implemented the use of an electronic medical record (AHLTA) in November 2005. Following the installation of AHLTA, productivity decreased. This study measured productivity at the provider level during each period. The dependent variable for this study was productivity, defined as Relative Value Units (RVU) divided by encounters. Regression results indicated that the overall model significantly predicted provider productivity, albeit weakly: $R2=.249$, $R2\ adj=.237$, $F(12, 759)=20.63$, $p<.05$. This model accounts for 23.7% of variance in provider productivity.

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An analysis of the impact of AHLTA implementation on Provider Productivity at Naval Hospital Jacksonville, Fl

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Army-Baylor University Graduate Program in

Health and Business Administration

Graduate Management Project Proposal

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Introduction

Naval Hospital Jacksonville is a general medical and surgical hospital offering both inpatient and outpatient care. The hospital serves more than 214,000 active duty service members, military family members and veterans in the Florida and Georgia area (Naval Hospital Jacksonville Patient Guide, 2007). The hospital and its branch health clinics are in the TRICARE South region. The hospital is staffed with approximately 1400 personnel. Naval Hospital Jacksonville consists of seven branch health clinics (BHC) and a Substance Abuse Rehabilitation Program (SARP). The seven branch health clinics are located at Mayport, FL; Naval Air Station Jacksonville, FL; Key West, FL; Kings Bay, GA; Albany, GA; Athens, GA; and Atlanta, GA. The hospital also has the Navy's largest family medicine residency program.

The command's philosophy and guiding principles are steered by a strong commitment to delivering quality centered patient care. For this study to be effective, it is important that this study align with the command's strategic plan. Naval Hospital Jacksonville (Patient Guide, 2007) command vision is:

> We are a service organization! We provide operational support, promote wellness and deliver quality health care to all those entrusted to us, anytime, anywhere. Our vision is to be first in service. Through readiness, staff development, and family centered care, we will be the Most Efficient Organization." (p. 8)

Conditions that Prompted the Study

In his 2007 statement to Congress, Dr. Winkenwerder (2007) stated that the Department of Defense is firmly committed to provide world-class health care to over nine million beneficiaries. The Department faces a tremendous challenge with growing costs. Winkenwerder argues that major changes are needed to ensure the Military Health Care (MHS) system's future. Raezer (2004) also states that the MHS must respond to a surge in operational commitments while facing an aging population, a growing retiree population, and Congressional pressure to reduce costs.

In response to increasing costs, the MHS is integrating a new model called the Prospective Payment System (PPS). The purpose of PPS is to change hospital behavior by providing financial rewards to efficient organizations (American Hospital Directory, 2007). One of the key output measures of the PPS model is provider productivity. MTF's revised performance metrics will integrate the PPS model. Dr. Winkenwerder (2007) stated that in the future Tricare Management Activity (TMA) will budget Military Treatment Facilities (MTF) according to performance and not based on historical budget assumptions.

A key measurement under the PPS model is provider productivity. Health care facilities use different tools for measuring their output. The MHS employs The Armed Forces Health Longitudinal Technology Application (AHLTA) for recording medical encounters and measuring productivity. Naval Hospital Jacksonville implemented the use of AHLTA between November 2005 and January 2006. According to Hendricks (2006), AHLTA is a Windows based medical information system that provides worldwide, secure online access to comprehensive medical records. Once fully implemented, AHLTA will be available to over 9.2

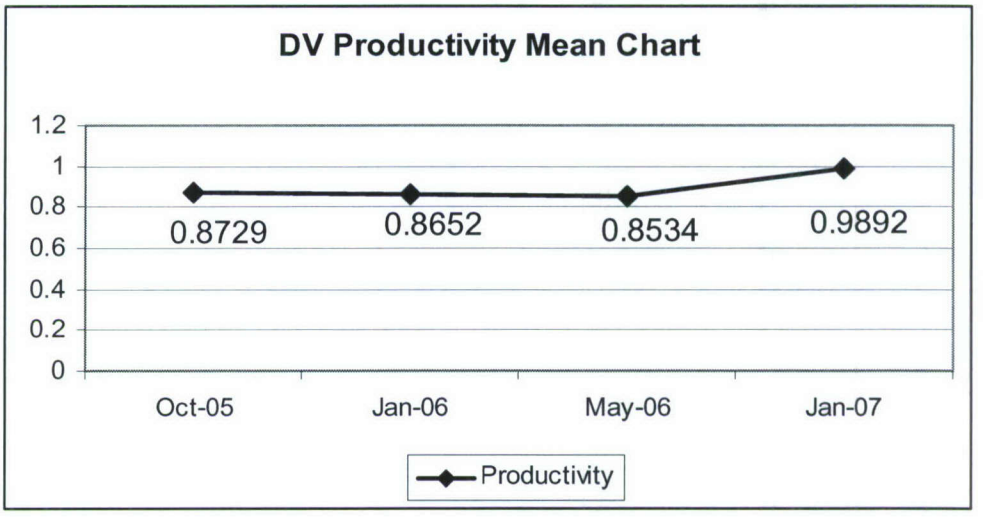
million beneficiaries, making it one of the largest Electronic Medical Record (EMR) systems in the world.

According to an article by the International Journal of Production Economics (Anonymous, 2007), organizations feel pressure from stakeholders to upgrade systems as soon as new versions are released. However, this may not be ideal because the software, AHLTA, and the organization's learning curve were not aligned. The article also emphasized that this misalignment may lead to decreased productivity following Information Technology (IT) implementation.

Statement of the Problem

According to Ozcan (2005), "It has often been said that a well-defined problem is half solved" (p. 50). Hospital metrics indicate productivity at Naval Hospital Jacksonville decreased after AHLTA's implementation (see Figure 1).

Figure1. Provider Productivity Mean Comparison.



Concurrent implementation of AHLTA and a mandate to align budgetary allocations with provider productivity have created an environment in which a multitude of issues must be managed effectively in order to bolster productivity. Assuming the cause of the productivity decrease may have issued from more than one source, determining the relationships between environmental characteristics, to include AHLTA-specific indicators, is considered key to understanding those which influence productivity.

Literature Review

Overview

The Military Health System is continuing its efforts of implementing a robust and all-encompassing technology infrastructure for managing patient information. In January 2004, the president of the United States set a goal for ensuring most Americans had an electronic medical record (EMR) by 2014. On 27 April, 2004, President Bush issued an executive order calling for widespread adoption of health information technology over the next 10 years; stressing the improvements in safety and efficiency this initiative can bring (Office of the National Coordinator for Health Information Technology, 2006). In response to this mandate, DoD implemented AHLTA. AHLTA is the DoD's version of an EMR. The MHS' goal is to fully implement AHLTA across DoD by 2011 (Hendricks, 2006). The purpose of EMR systems is to improve the quality of patient care and decrease medical errors, but their financial benefits have not been well documented (Wang et. al, 2003).

According to the Office of the National Coordinator for Health Information Technology (2007), financial barriers exist for implementation of EMRs. Initial investment costs are high while implementing EMRs. In the civilian sector, performance is directly linked to compensation. An important difference between MHS providers and their civilian counterparts is that the salaries of MHS providers are not directly linked to volume. However under the Prospective Payment system model, MTFs will be funded based on output rather than input, paralleling civilian business models (Raezer, 2004). AHLTA provides MHS providers with a powerful tool for delivering healthcare while meeting financial performance goals (Executive Information and Decision Support, 2005).

AHLTA delivers many benefits to the MHS. ALTHA gives providers electronic, real-time access to beneficiaries' conditions, prescriptions, diagnostic tests and additional information to ensure quality care. One of the key features of AHLTA is real-time access anywhere. This feature is of critical importance for the military forces deployed. Medical personnel are now able to access patient information from a personal digital assistant (PDA) to ensure care is provided to service members in combat (Office of the Assistant Secretary of Defense (Health Affairs) and the TRICARE Management Activity, 2005). This is important because the diagnosis and treatment provided to the patient will be stored digitally, decreasing medical errors and ensuring the data is transferred to the patient's medical record.

The focus of this study is provider productivity, the dependent variable, and the independent variables that are significant to productivity. Kongstvedt (2002) states that defining and measuring productivity has been troublesome, particularly in the healthcare industry. Determining what factors are significant to medical output can assist in improving provider productivity. The independent variables for this study include training, provider type, provider clinic, AHLTA utilization, and provider category. These variables were chosen for this study because research, as outlined in the following paragraphs, has demonstrated that they may influence productivity.

Provider Productivity Defined

According to Jones & Jansen (2006), the rate at which providers see patients is often called productivity; however many factors, other than the number of patients treated, influence his or her productivity. Finkler & Ward (p. 429, 1999) further define productivity as the ratio of any given measure of output to any given measure of input over a specified period of time. For this study, productivity is measured by the total number of RVUs per encounter, measured

monthly. This method provides a means for comparing physician performance across specialty lines within a group and with external physician groups.

Coding is the basis of quantifying productivity. The sum of all the CPT and E&M numerical values, expressed as Relative Value Units (RVU's), equals the facility's total outpatient productivity. RVUs are subdivided into three categories. These categories are physician work (work RVU), malpractice expense (Malpractice RVU), and practice expense, known as facility RVU (Glass, 2003). For this study, individual physician RVU's per encounter will be used to measure productivity.

An RVU is composed of the combination of E&M and CPT codes assigned to the encounter at the completion of a patient's visit (Levinson, 2006). AHLTA assigns CPT and E&M codes to each encounter based on the data entered by the provider during the visit. If the provider fails to properly record all the work performed during the encounter using AHLTA, the assigned RVU value for that visit may not reflect the actual value for the work performed (Office of the National Coordinator for Health Information Technology, 2006).

According to Levinson (2006), coded data go farther and do more than ever before, making it imperative for providers to stay abreast of many rapid changes. One of the biggest changes is the expansion of coding from its traditional role of translating narrative clinical text into diagnosis and procedure codes. Coding must now meet an emerging need to capture healthcare data in a standard format that has universal meaning and can be applied both at the individual and aggregate levels.

One of the challenges providers encounter while recording care provided using Current Procedural Terminology (CPT). According to Beebe (2005), CPT is a set of codes, descriptions and guidelines intended to describe procedures and services performed by health care

professionals. Each procedure is assigned a five digit code. That code is translated into a numerical value that represents the visit's complexity.

According to the Centers for Medicare & Medicaid Services (2006), the original purpose of CPTs was to streamline and standardize billing for Medicare and Medicaid services for outpatient services. Correct usage of CPT codes is essential for collection and billing of medical services. The MHS uses the Medicare model to record all outpatient encounters and to measure productivity. The MHS also uses the model for billing services provided to Medicare and Medicaid eligible patients.

CPTs are divided into six sections: Evaluation and Management (E&M); anesthesiology; surgery; radiology; pathology and laboratory; and medicine (Levinson, 2006). CPT provides a reporting mechanism for physician and hospital outpatient services. Two new categories were developed to extend its function. Category II codes (performance measurement) facilitate data collection of services and test results that are agreed upon as contributing to positive health outcomes and quality patient care. They are considered a set of optional tracking codes for performance measurement. Category III codes (emerging technology) facilitate data collection and assessment for new technology, services, and procedures in widespread use or in the FDA approval process (Foley, 2006).

Most patient visits are coded using the E&M section of the CPT table. The E&M section is further divided into three broad categories. These categories are office visits, inpatient visits, and consultations or referrals. Within these categories, office visits are the most frequently used (Levinson, 2006). The above subset of CPT codes is important because they account for about 75% of all coding entered into AHLTA by providers at Naval Hospital Jacksonville. Familiarization and understanding of these codes is essential not only to providers, but to

ancillary staff to better understand how to properly document encounters and maximize utilization, resulting in increased productivity. Training providers in understanding CPT usage is important for increasing productivity (Levinson, 2006).

Training

According to the U. S. Department of Health and Human Services (2007), coded data play an important role in ensuring appropriate reimbursement for healthcare services rendered for institutional or provider claims. This importance continues to increase as prospective payments have evolved to include other treatment settings, such as inpatient psychiatric facilities (Raezer, 2004). Levinson (2006) states that, with proper training, healthcare professionals are uniquely qualified to interpret and implement policies that govern reimbursement. They can provide leadership within organizations to ensure that clinical documentation is accurate and appropriate to support the diagnoses and procedures selected for reimbursement.

Training is important during implementation because workflow and procedures developed for paper records are no longer relevant when electronic records are used and new processes must be adopted. As more terminologies and code sets are employed in the EMR, version control and software updates become a challenge and can add overhead costs. This problem is very challenging because providers are expected to keep abreast of the changes in terminology. Failure to implement changes results in improper coding, leading to an incorrect RVU count (Foley, 2006).

Training is important because research has demonstrated that adults' cognitive performance can be improved via formal training (Margrett & Willis, 2006). In a 2006 retrospective study, Furka, Brath, Nemeth, and Moko (2006) argue that individual training is more effective than mass training. They suggest that individual tutors offer invaluable advice,

and they can adjust the training to the student's specific needs. Bearing this in mind, Naval Hospital Jacksonville hired three AHLTA trainers in October 2006. These individuals provide classroom and individual training, which is made available to all staff members, with special emphasis on providers.

According to Levinson (2006), most physicians learn about medical records during the second year of medical school in a course usually called "Introduction to Physical Diagnosis". The course teaches students that the medical record is a tool for the interaction between physicians and patients. Physicians are taught how to obtain a comprehensive history, yet Levinson argues that most physicians are not taught about E&M coding compliance during the didactic portion of medical school training. He suggests that medical schools have failed to incorporate these skills into their curriculum, resulting in a lack of preparation of physicians that would enable them to meet the challenge of coding after medical school.

Addressing template management during training is important because it is the basis for coding encounters using AHLTA. AHLTA was designed around templates to make the process of recording patient transactions easier. According to Rollins (2006), potential problems, such as record cloning, results from overuse of templates that lead to the coding of each encounter. This may become apparent during audits when a set of records by a specific provider look identical. Record cloning also raises reimbursement issues, since payers require documentation that is specific to and accurately reflective of each unique encounter. Medicare warns that defaulted documentation of this kind can harm quality of care as well as result in reporting a more extensive history and physical examination than is medically necessary (U. S. Department of Health and Human Services, 2007).

Levinson (2006) states that current curriculum at medical schools does not address this training. Providers receive a four-hour AHLTA classroom training session during the command indoctrination. The four-hour classroom training may not be sufficient for training providers on AHLTA. Beginning October 2006, Naval Hospital Jacksonville addressed this concern by providing on-site individualized training to providers.

Provider Type

Naval Hospital Jacksonville offers primary and specialty services to its patient population. This study compares RVU productivity by provider type by analyzing productivity measures among specialty care and primary care providers. Productivity results among these providers may differ because according to Lando (2003) Medicare reimbursement rates are higher for some procedures performed by specialty care providers. Franks and Fiscella (1998) add that managed care has resulted in debate regarding the use of specialized versus primary care in terms of patient outcomes and costs resulting in different productivity outcomes among the groups.

Providers are not the only members of the staff who utilize AHLTA to record productivity. Others providers such as nurses, pharmacists, dieticians, case managers, respiratory and occupational therapists will interact with the system with far greater frequency than the majority of physicians. Mid-level practitioners, such as nurse midwives, physician's assistants, and nurse practitioners, must also be considered in the selection, design, and building phases. Early engagement of each group in the process will solidify their understanding of the complexities, the need for the product, and the impact on how accurately they do their jobs (McCoy, 2006). It is important to address our support staff during this study because lack of knowledge of AHLTA may contribute to decreased productivity.

Provider Clinic

Naval Hospital Jacksonville provides primary and specialty care to eligible beneficiaries. Primary and specialty care providers are not expected to yield the same productivity benchmarks. According to research by Vonderheid, et al. (2004) not all work performed by medical professionals is captured using RVU methods and that the value of care between primary and specialty providers differ. Primary and specialty providers deliver different levels of care. Some of these services include comprehensive health evaluations and patient education. Also, providers other than board certified physicians can perform only low-level care that captures lower CPT code values.

AHLTA Utilization

Learning curves may lead to decreased output. During implementation AHLTA utilization may decrease, an article published by the International Journal of Production Economics (2007) suggests that software upgrades may not be aligned with the organization's learning curve. This may lead to productivity loses. This study quantifies AHLTA utilization to determine if the organization's software upgrade may have contributed to a decrease in productivity

Provider Category

This study measures productivity among military, civilian, and contracted provider categories as Naval Hospital Jacksonville employs these provider types. According to Hendricks (2006), military departments do not expect significant differences in the level of care or productivity between military and civilian health care personnel. Military services maintain the same credentialing and privileging requirements for delivery of health care by military or civilian employees. However, military providers are required to perform additional duties that civilian

and contracted employees are not required to do. This limitation may account for different outcomes among provider categories.

Assessing productivity by academic general pediatricians against MGMA standards, Andreae (2002) examines the effects on clinical productivity among provider categories and compared their output with Medical Group Management Association (MGMA) standards. The study reveals that productivity outcomes vary among the provider categories analyzed, exposing that over half of the population fell below the MGMA 25th percentile. A study by Johnson (2002) posits that the average enrollment panel of military providers is significantly lower compared to civilian staff providers. He lists mission support, occupational medicine, and other military-unique factors as the most significant differences between the groups.

Limitations

According to the International Journal of Production Economics (2007), there are limitations during the EMR implementation period. Market barriers and challenges to widespread adoption of health information technology include adoption issues, a lack of a robust business case for IT implementation, adoption gaps based on organization size and complexity, availability of IT expertise, and learning curves (International Journal of Production Economics, 2007; U. S. Department of Health and Human Services, 2007).

Rollins (2006) argues that potential problems result from the upgrade of legacy systems. Some of these problems include system functionalities, reviewing existing contracts, and audit mechanisms. AHLTA is scheduled to be fully functional by the year 2011 and the MHS will discontinue the use of the Composite Health Care System (CHCS). During the implementation period, the MHS will need to evaluate potential interface problems with legacy systems. According to Rollins (2006), organizations must address the here-and-now of the legacy systems

currently in operation. He suggests that when there are perceived problems with an application, the first step is an overall risk assessment, including a review of HIPAA regulations and state and federal laws.

Summary

The above discussion supports the inclusion of dependent and independent variables and provides a framework for subsequent analyses. The purpose of this study is to determine the relationship between the dependent variable (DV), productivity, and the independent variables (IV): AHLTA training, provider type, provider clinic, ADM compliance, and provider category. The methods and procedures sections that follow operationally define the variables that serve as the basis for this project.

Purpose

Naval Hospital Jacksonville implemented the use of AHLTA during the period between November 2005 and February 2006. The purpose of this study is to compare provider productivity at Naval Hospital Jacksonville over four time periods associated with AHLTA implementation. The unit of analysis for this study is the provider. The dependent variable is productivity, measured as total RVUs divided by total encounters.

This study is important because productivity benchmarks under PPS determine future funding for the hospital. Low output, as measured by productivity, leads to decreased funding for the hospital. The utility of this study is to discover the relationship between the independent variables and the dependent variable, provider productivity, in relation to AHLTA's implementation. The results allow hospital leadership to apply findings relevant to the establishment of business rules.

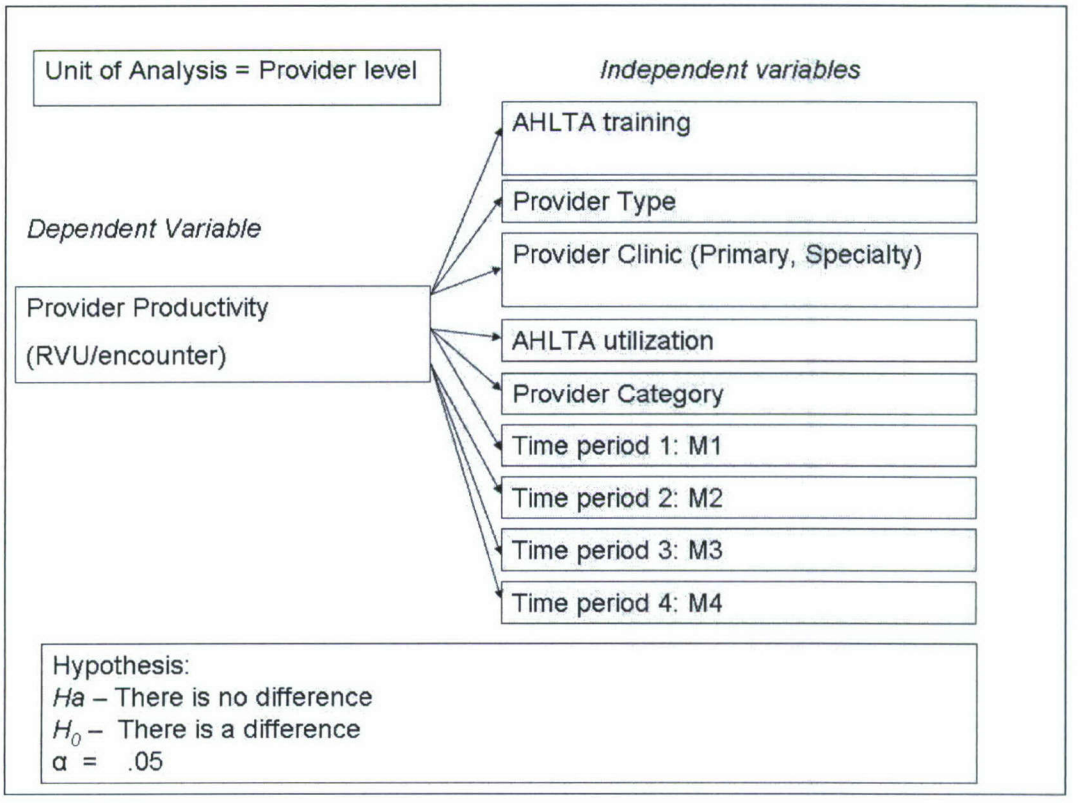
Methods

Hypothesis and Variables

Figure 1 is a graphical representation of this study's model. The null hypothesis speculates that there is no difference between the time periods, H_0 = No Difference Model. The alternate hypothesis posits that a significant difference between the four groups exists, H_a = Difference Model. The alpha, or critical probability level, is set at .05 ($\alpha = .05$).

The dependent variable for the study is RVUs per encounter. The independent variables consist of: AHLTA training, provider type, provider clinic, ADM compliance, provider category and time periods, a base line with three subsequent measures (see Figure 2).

Figure 2. Provider Productivity Model.



Operational Definitions

Dependent Variable

The dependent variable for this study is RVUs per encounter, calculated as total RVUs divided by total encounters (Executive Information and Decision Support, 2006). Franks and Fiscella (1998) define an RVU as the clinician-resource intensity of an encounter, calculated by multiplying the adjusted RVU by the sum of the participating providers' costliness. Executive Information and Decision Support (2005) and Centers for Medicare & Medicaid Services (2006) define an encounter as an outpatient visit to a licensed health care provider. According to the Centers for Medicare and Medicaid Services (2006), an encounter is a face-to-face contact for the delivery of a medical or mental service. These services may be performed by a licensed and credentialed physician, physician assistant, nurse practitioner, and other health allied professional (see Appendices A and B).

Independent Variables

1. AHLTA Training. The independent variable, AHLTA training, is categorical data, coded as (0) no training, (1) classroom training, or (2) individual training (see Appendices A and B). Hart (1991) defines training as a set of instructions to help someone perform a particular task better. Training is different from education in that "education focuses on learning about, training focuses on learning how", or how to accomplish a specific project (Milano, 1998).

2. Provider type. The independent variable, provider type, is categorical data, coded as: (0) board certified physician, (1) physician assistant, (2) nurse practitioner, and (3) independent duty corpsman.

3. Provider clinic. The independent variable, provider clinic, is categorical data coded as (0) primary care and (1) specialty care.

4. AHLTA utilization. The independent variable, AHLTA utilization, is continuous data, calculated as the total number of encounters coded using AHLTA divided by the total number of encounters.

5. Provider category. The independent variable, provider category, is a categorical data, coded as (0) military, (1) civilian employee, or (2) contractor.

Data Sources

This study examines the independent variables in the aggregate, and in relation to AHLTA implementation. The four time periods chosen are categorized as pre-AHLTA implementation, during AHLTA implementation, and two post-AHLTA implementation groups. Each group included total monthly data for the time studies and is labeled as Prod_Oct05, Prod_Jan06, Prod_May06, and Prod_Jan07.

- Prod_Oct05 equals production data from 1-31 October 2005
- Prod_Jan06 equals production data from 1-31 January 2006
- Prod_May06 equals production data from 1-31 May 2006
- Prod_Jan07 equals production data from 1-31 January 2007

The study employs a time series regression analysis, to include the creation of dummy variables for three time periods that were compared with the reference period, October 2005. Data are to be examined to determine if there was a significant relationship between the dependent variable, provider productivity, and the independent variables under consideration. The assumptions for regression analysis include: the dependent variable, provider productivity, is a continuous variable, and normally distributed; variables are mutually exclusive; and that the variables are homogenous (Duncan, Knapp, & Miller, 1983).

Limitations

Secondary data is used for this study. The use of secondary data is beneficial in that improves data collection efficiency and reduces the time spent locating and gathering information. The data is sourced from the MHS Management Analysis Reporting Tool (M2), CHCS, MEPRS, DMHRSI, and interviews. M2 is considered a powerful ad hoc query tool, as it is used by analysts for querying clinical, financial, and beneficiary information. M2 collected

data from the MHS Data Repository, which is fed from the Composite Health Care System (CHCS), the Expense Accounting System (EAS), the Medical Expense and Performance Reporting System (MEPRS), and several other database systems employed by the MHS.

The reliability of the data from any of the databases which feeds into M2 is considered contingent upon the accuracy of the staff entering the information (Executive Information and Decision Support, 2005). The question of accuracy poses a potential limitation to the study; however, the data is considered the most accurate and reliable information available, and is used daily by military health care facilities around the world.

Results

The results section consists of descriptive statistics for all dependent and independent variables plus differential statistics for each one of the four time periods. The case size, N=190, was obtained by limiting subjects to providers who saw patients for each of the four time periods at Naval Hospital Jacksonville or any of the seven BHCs. Providers who did not see patients during each one of the four time periods were removed from the study. The independent variable, AHLTA training was 98% complete, and missing data of less than 2% were reconciled by applying mean statistics to account for missing fields. Alpha levels were set at $p < .05$.

Descriptive Statistics

Descriptive statistics were analyzed for all independent and dependent variables, and the results are summarized in Table 1. Sample sizes were identical for all variables, N=190. Standard Deviations (SD) for all variables were large relative to the means for the independent variables. Training 1 and Compliance 1 reflected baseline measures of zero as AHLTA was not yet deployed at Naval Hospital Jacksonville during the time period of October 2005.

Table 1. *Summary of Descriptive Statistics Across Time Periods.*

Variable	*N*	*M*	*SD*
Productivity 1	190	0.8729	0.7545
Productivity 2	190	0.8652	0.6596
Productivity 3	190	0.8534	0.6006
Productivity 4	190	0.9892	0.6361
Training 1	190	0.0000	0.0000
Training 2	190	0.7316	0.4443
Training 3	190	0.9263	0.2619
Training 4	190	1.0789	0.3070
Compliance 1	190	0.0000	0.0000
Compliance 2	190	0.4333	0.3486
Compliance 3	190	0.6077	0.3109
Compliance 4	190	0.8645	0.2408

Regression Analysis

Standard multiple regression was conducted to determine the accuracy of the independent variables (AHLTA training, AHLTA compliance, provider type, provider clinic, and provider category) in predicting provider productivity, defined as RVUs divided by encounters. Data screening led the elimination of several cases due to personnel transfers. Evaluation of linearity was evaluated using both Chi square and histogram methods. Natural log transformations were considered for a few variables, but were not included. To reflect conditions as constructed in the real world, it was determined that violations of linearity and homoscedasticity would be ignored, as violations merely weakened the regression analyses, but did not invalidate it (K. Finstuen, personal communication, October 23, 2006; Tabachnick & Fidell, 2001).

Regression results indicated that the overall model significantly predicted provider productivity, albeit weakly: R^2=.249, R^2 adj=.237, F (12, 759)=20.63, p <.05. This model accounted for 23.7% of variance in provider productivity. A summary of regression coefficients, presented in Table 1, indicated that only four (provider types 2 and 3, nurse practitioner and independent duty corpsman, provider clinic, and provider category, GS civilian) of the aspects of the independent variables significantly contributed to the model (see Tables 2 and 3).

Table 2. *Model Summary.*

					Change Statistics				
Model	*r*	R^2	Adjusted R^2	Std. Error of the Estimate	R^2 Change	*F* Change	*df1*	*df2*	Sig. *F* Change
1	.499(a)	.249	.237	.582	.237	20.633	12	759	.000

Table 3

Coefficients (a)

	Coefficients	Std. Error	*F* Change	Sig. *F* Change
(Constant)	.801	.118	6.788	.000
Trained = 1 (dummy) Classroom training	.068	.081	0.835	.404
Trained = 2 (dummy) Individual training	.144	.168	0.858	.391
AHLTA Compliance (continuous)	.145	.082	1.770	.077
Prov type = 1 Physician Assistant	-.108	.067	-1.611	.108
Prov type = 2 Nurse Practitioner	-.412	.060	-6.904	.000
Prov type = 3 Independent Duty Corpsman	-.725	.102	-7.092	.000
Prov clinic = Specialty	.437	.044	10.051	.000
Prov_Cat =1 GS Civilian	-.210	.062	-3.404	.001
Prov_Cat = 2 Contractor	-.032	.058	-0.563	.573
Time 1: 1-31 January 2006	.083	.124	0.669	.504
Time 2: 1-31 May 2006	-.037	.074	-0.505	.613
Time 3: 1-31 January 2007	-.087	.065	-1.351	.177

a Dependent Variable: Provider productivity

A summary of findings indicated that AHLTA training was not significantly related to provider productivity, and that AHLTA compliance was not significantly related to provider productivity. However, provider type (nurse practitioner and independent duty corpsman) was significantly and negatively related to productivity, thus supporting research indicating productivity measures decreased under lesser qualified categories. Results also indicated that specialty clinics were more productive, as measured by RVUs/encounters and that the provider category of GS civilian employees bore a significant, negative relationship with productivity.

Discussion and Conclusions

The purpose of this research was to determine if the independent variables training, provider type, provider clinic, AHLTA utilization, and provider category were significant in influencing the dependent variable, provider productivity. The results of this study were presented to the Commanding Officer, Naval Hospital Jacksonville with recommendations for each of the independent variables.

The independent variable training was not statistically significant, and did not support the study by Furka, Brath, Nemeth, and Moko (2006) that found adult learners were more likely to benefit from individualized training compared to classroom training. The command initiative to deliver training to the provider was implemented in the latter part of the study. Qualitative observations of this variable were positive in that providers welcomed the one-to-one training sessions and felt that the command was proactive in delivering the information needed for implementation. Therefore, it was the recommendation of this study to revisit the impact of individual training after the individual training program became more stable to determine if the program was effective.

The independent variable, provider type, was statistically significant and supported the literature research in that specialty providers treated more complex patients compared to primary care providers (Lando, 2003; McCoy, 2006). Provider attributes such as provider type (nurse practitioner and independent duty corpsman) were significantly and negatively related to productivity, thus supporting research indicating productivity measures decreased under these categories. Recommendations for future studies may include consideration for broadening the

scope of the independent variable, provider type, so as to incorporate individual specialties within each category.

The independent variable, provider clinic, was statistically significant and supported the literature research in that the specialty clinics, as compared to primary care clinics, saw more complex patients and generated a higher RVU value per encounter (Vonderheid et al., 2004). Thus, results support research findings that indicate specialty clinics were more productive, as measured by RVUs per encounter, perhaps as a function of higher coding practices.

The independent variable, AHLTA utilization, was not statistically significant. AHLTA was new to the MHS and had not been included in studies supporting the use of this particular model. As the unit of analysis was at the provider level and not at the MTF level, further studies may improve upon this model by expanding the analysis to the facility level.

The independent variable, provider category, was statistically significant and did not support the study by Hendricks (2006) in that military departments do not expect significant differences in the level of care or productivity between military and civilian health care personnel. In sum, results indicated that the provider category of GS civilian employees bore a significant, negative relationship with productivity. This result may, therefore, reflect an unwillingness or incapability to adapt to the changing technological environment, thus impacting negatively on individual productivity. However, discovering the root causal factors of this issue may need to be addressed further in a follow-on study.

Study findings indicate that there are statistically significant differences between the certain independent variables and the dependent variable, provider productivity. The identification of the independent variables and their statistical importance enables the command to alter business rules, with the intent of increasing productivity. The utility of this study is in

determining if AHLTA implementation contributes to decreased productivity. Using a repeated measures regression analysis, this study quantifies the impact of AHLTA implementation on utilization and provides a basis for improvement.

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Appendix A: Operational Definitions

For the purpose of this study, the following operational definitions apply:

ADM. Ambulatory Data Module. CHCS module where encounter information is stored.

AHLTA. Armed Forces Health Longitudinal Technology Application, formerly CHCS.

ANOVA. Analysis of Variance.

BHC. Branch Health Clinic.

CHCS. Composite Health Care System.

Consultation. A type of medical service provided by a physician whose opinion regarding evaluation and/or management of a specific problem is requested by another physician or other appropriate source.

Current Procedural Terminology (CPT) Coding System. The set of five-digit codes, descriptions and guidelines used to describe services performed by healthcare professionals.

Electronic Medical Record (EMR). An electronic medical record system with the ability to provide interconnectivity and interoperability with external medical systems, such as pharmacy, laboratory, radiology, facilities, and hospitals.

Established Patient Visit. Any subsequent medical encounter within three years of a visit with a specific physician or his or her associates in the same specialty and in the same medical group.

Evaluation and Management (E/M) Coding System. The portion of the CPT coding system, involving codes 99201-99499, that addresses cognitive medical services.

IT. Information Technology.

MHS. Military Health System.

MTF. Military Treatment Facility.

PPS. Prospective Payment System.

RVU. Relative Value Unit.

SARP. Substance Abuse Rehabilitation Program.

Appendix B. Code Sheet

Variables	Description	Type of data, coding	Data Source
Provider ID: (ProvID)	Appointment provider ID. ID is unique to Naval Hospital Jacksonville	Nominal, mutually exclusive	M2/CHCS
Provider Productivity – time period 1: (Prod_Oct05).	Provider productivity, 1-31 Oct 2005, measured as total number of Relative Value Units divided by total number of Encounters.	Continuous variable	M2
Provider Productivity – time period 2: (Prod_Jan06)	Provider productivity, 1-31 Jan 2006, measured as total number of Relative Value Units divided by total number of Encounters	Continuous variable	M2
Provider Productivity – time period 3: (Prod_May06)	Provider productivity 1-31 May 2006, measured as total number of Relative Value Units divided by total number of Encounters	Continuous variable	M2
Provider Productivity – time period 4: (Prod_Jan07)	Provider productivity, 1-31 Jan 2007, measured as total number of Relative Value Units divided by total number of Encounters	Continuous variable	M2
AHLTA training (TRNG1)	AHLTA training, 1-31 Oct 2005. Measured as no training received = 0, classroom training = 1, and individual training = 2.	0 = No training 1 = Classroom training 2 = Individual, on-site training	Local training record/Interview/training rosters
AHLTA training (TRNG2)	AHLTA training, 1-31 Jan 2006. Measured as no training received = 0, classroom training = 1, and individual training = 2.	0 = No training 1 = Classroom training 2 = Individual, on-site training	Local training record/Interview/training rosters
AHLTA training (TRNG3)	AHLTA training, 1-31 May 2006. Measured as no training received = 0, classroom training = 1, and individual training = 2.	0 = No training 1 = Classroom training 2 = Individual, on-site training	Local training record/Interview/training rosters
AHLTA training (TRNG4)	AHLTA training, 1-31 Jan 2007. Measured as no training received = 0, classroom training = 1, and individual training = 2.	0 = No training 1 = Classroom training 2 = Individual, on-site training	Local training record/Interview/training rosters
AHLTA Compliance (AHLTA_COMP1)	Percentage of encounters closed out on AHLTA, 1-31 Oct 2005. Calculated as total number of encounters closed on AHLTA divided by total number of encounters.	Ordinal. 0 % … 100 %	M2/CHCS
AHLTA Compliance (AHLTA_COMP2)	Percentage of encounters closed out on AHLTA, 1-31 Jan 2006. Calculated as total number of encounters closed on AHLTA divided by total number of encounters.	Ordinal. 0 % … 100 %	M2/CHCS
AHLTA Compliance (AHLTA_COMP3)	Percentage of encounters closed out on AHLTA, 1-31 May 2006. Calculated as total number of encounters closed on AHLTA divided by total number of encounters.	Ordinal. 0 % … 100 %	M2/CHCS

Appendix B. Code Sheet (cont.)

AHLTA Compliance (AHLTA_COMP4)	Percentage of encounters closed out on AHLTA, 1-31 Jan 2007. Calculated as total number of encounters closed on AHLTA divided by total number of encounters.	Ordinal. 0 % … 100 %	M2/CHCS
Provider type (PROV_TYPE)	Type of provider providing care. Board certified physician, Physician Assistant, Nurse Practitioner, Independent Duty Corpsman	0 = Board Certified Physician 1 = Physician Assistant 2 = Nurse Practitioner 3 = Independent Duty Corpsman	MEPRS/ DMHRSI
Provider clinic (PROV_CLINIC)	Primary Care, Specialty care	0 = Primary care 1 = Specialty care	MEPRS/D MHRSI
Provider category (CATEGORY)	Military, GS – Civilian, Contractor	0 = Military 1 = GS – Civilian 2 – Contractor	MEPRS/ DMHRSI